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§ 81. Notes on Gymnosporangia.

By W. G. FARLOW.

Since the publication of my paper on the *Gymnosporangia* of the United States I have received several communications with regard to the distribution of our species; and, as one of my principal objects was to investigate the supposed genetic connection between the genera *Roestelia* and *Gymnosporangium*, any information with regard to the distribution of the species of the two genera is of interest. At the time when my paper was originally presented to the Boston Natural History Society I had never seen specimens of *Gymnosporangium speciosum*, Peck, described in the *Botanical Gazette* of October, 1879. Recently I have received fresh material from Mr. T. S. Brandegee, by whom the species was originally discovered on *Juniperus occidentalis*, in Colorado. The specimens received show fusiform swellings of the branches and irregularly-flattened sporiferous masses of the pale yellow color usually seen in specimens of the genus which have been expanded by rains and then dried. The species is evidently closely related to *Gym. biseptatum* and intermediate between it and *Gym. clavipes*. It resembles the former in the distortions produced, and in the general appearance of the sporiferous masses; and the spores, although larger and on stouter pedicels, are frequently composed of three cells as in *Gym. biseptatum*. The spores germinate at the septum, and I have seen no case of germination at the apex as is usual in *Gym. clavipes*. *Gym. speciosum* should be added to the number of species enumerated in my paper, but its relations to any species of *Roestelia* cannot, at present, be discussed because the mycological flora of the Rocky Mountains is still too little explored.

Some instructive specimens have also been received from Dr. J. H. Mellichamp, collected at Bluffton, S. C. Amongst others, are specimens which approach more nearly the true *Gym. fuscum* of Europe than any that I have examined from the Northern States. The specimens in question were on *Juniperus Virginiana*; and, besides the common globose form, there were two specimens in which fusiform enlargements of the branches were formed, and the sporiferous masses were quite similar to those found on junipers in Europe. It seems probable, then, that what I have called *Gym. fuscum*, var. *globosum*, is in reality merely a variety, and not a distinct species. In passing, I would remark that all the specimens sent by Dr. Mellichamp seem to indicate a more luxuriant development of the different *Gymnosporangia* in South Carolina than in the case of the same species when growing in New England. Thus, several specimens of *Gym. macropus* exhibit knots so large that the branch above is strangled, and the leaves distorted, whereas such is only very rarely the case in Eastern Massachusetts.

With regard to the prevalence of *Gym. macropus* in Illinois, Prof. T. J. Burrill writes as follows: "*Gymnosporangium macropus* is very

common here (Champaign) on *Juniperus Virginiana*; and a *Roestelia* on the orchard apple and on *Pyrus coronaria* appears as common. But I do not find any interdependence between them. Junipers are not indigenous, and great areas, many miles in extent, exist without a specimen, yet the *Roestelia* seems to occur in such places as commonly as near the affected trees." Prof. W. R. Dudley writes that "at Bloomington, Ind., last spring, the cedar (*J. Virginiana*) was comparatively abundant both in and around the town, although not a native of the section. I think I never saw the *Gymnosporangium macropus* so abundant as on these trees. In the latter part of April, during certain rainy days, they were particularly noticeable, giving the branches an orange hue at a distance and weighing down the branches as much as two or three inches of light snow might. I noticed also there were many of the old apple carcasses of previous years." Mr. Wm. Trelease, also, informs me that he found *Gym. macropus* to be not rare in the vicinity of Madison, Wis.

In conclusion, a word as to the inferences which can logically be drawn from the relative abundance and proximity to one another of the different *Gymnosporangia* and *Rosteliae*. Because one finds, for instance, a certain *Gymnosporangium* on *Juniperus Virginiana* in the immediate neighborhood of apple trees which are attacked by a *Roestelia* is no proof whatever of any genetic connection between the two. One would undoubtedly also find an abundance of *Puccinia Graminis* near the same apple trees; and, although no one supposes any connection to exist between the *Puccinia* and *Roestelia*, yet, on logical grounds, we might just as well believe in a connection in the latter case as in the former. On the other hand, however, if we find a teleutosporic form, as *Gymnosporangium*, occurring in districts remote from the aecidial form, as *Rostelia*, we are warranted in inferring that there is no *necessary* connection between them. Now in the case of some of our species of *Gymnosporangium*, which are found also in Europe, it is certainly true that they occur only at very great distances from the *Roestelia* with which they have been associated by European botanists, and yet the teleutospore form itself is very abundant. The case of *Puccinia Graminis* is in this respect still stronger, for, although very common in the grain fields of the West, its supposed aecidium, which occurs only on the barberry, is there quite wanting. It may be said that, in the West, *Aecidium Berberidis* is replaced by some other *Aecidium*; but, what it is, is certainly not known, nor even suspected. Perhaps the strongest case is that of *Calyptospora Goeppertiana*, which grows on *Vaccinium*, and the aecidial stage of which is said by Hartig to be *Aecidium columnare*, which grows on firs. Although not rare in the Rocky Mountains and westward, the *Calyptospora* is certainly rare near Boston, and I have found it only once on a single plant of *Vaccinium corymbosum*, which grew in a deep swamp at Newton amongst *Cupressus thyoides*. The fungus was well developed on the *Vaccinium*, but it is impossible that the *Aecidium columnare* could have been present, as there were no fir trees anywhere to be found; and, in fact, I have never been able to detect *Aecidium columnare* anywhere near Boston. The species of *Uredineae* found in the neighborhood were *Gymnosporangium Ellisii* and *Gym. biseptatum*, which

could have had no connection with the *Calyptospora*. How are we to account for the presence of the *Calyptospora* on a moderate sized *Vaccinium* bush in a deep cedar swamp, if one of the necessary stages of its development is *Aecidium columnare*? Here then we have three different genera, including teleutosporic forms found both in Europe and this country, and yet what is assumed in Europe to be the necessary aecidial form is wanting with us. But certainly we must assume that, in matters of development, what is true of a fungus in one country must be true in another. In the present question, it will be observed that the cumulative character of the evidence is of value.

§ 82. Abnormal Habit of Asclepias amplexicaulis.

By H. W. RAVENEL.

About ten years ago, in a note to Prof. Gray (which he afterwards presented with his comments at the meeting of the Amer. Assoc. for Adv. of Science in Indianapolis, 1871*) I called his attention to the seemingly one-ranked leaves of *Baptisia perfoliata*; and traced the cause of this anomaly to the peculiar attachment of the leaves to the stem. I have lately observed the same thing in *Asclepias amplexicaulis*—the only difference being that in the case of the latter the leaves are opposite—in the former, alternate.

The habit of *Asclepias amplexicaulis* is to throw out several (2 or 3 to a dozen) stout stems from the roots, all diverging at once and assuming a recumbent position. The stems are almost universally unbranched, and the inflorescence occupies the axils of the upper leaves. The stems being horizontally reclined, the leaves all assume a vertical position, exposing both surfaces alike to the sun.

The leaf arrangement is evidently distichous (phyllotaxis $\frac{1}{2}$), and the twisting of the stem, alternately from right to left and left to right (the torsion taking place whilst the leaves are unfolding) brings them ultimately to a double, one-ranked series.

As in the case of *Baptisia perfoliata*, the alternate torsion of each internode in opposite directions can be traced on the stem, but is more clearly seen by stripping off a leaf with the adhering bark downward from one node to the next, when it is seen to pass spirally through half the diameter of the stem, from right to left and from left to right alternately through its whole extent, the torsion being pretty uniform through the internodal spaces. This alternate twisting in different directions relieves the stem of a continuous torsion through its entire axis. The equilibrium is thus restored, each alternate pair of leaves standing in its proper normal position. The upper pair of leaves, where the vegetative strength is nearly exhausted, is smaller, and retains very nearly its normal position at right angles with the next lower pair.

The specific name, *amplexicaulis*, is rather a misnomer if critically considered. The base of the petiole is not enlarged nor clasping. The thick, fleshy, succulent leaves are strictly cordate, with obtuse rounded points, the petioles so short that the auricles or lobes encircle the stem, thus giving the appearance of true amplexicaul leaves.

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